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THE REPTILES OF EAST GIPPSLAND

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Introduction

Gippsland is included in Spencer's (1896) Bassian zoogeographic subregion and its reptile fauna has been described as typically Bassian (Rawlinson 1966, 1967). However the data and principles on which this conclusion was based were not given in these earlier papers and the present account of the reptiles of East Gippsland provides an opportunity to correct the situation.

The Bassian subregion (*sensu* Serventy & Whittell 1951) lies within the temperate zone, and temperatures in the area are generally lower than those prevailing elsewhere in Australia. This factor is a most important one for reptiles, as internal thermoregulation is the only major physiological homeostatic capacity which they lack (Bartholomew 1958). Temperatures decrease with an increase in latitude and altitude; thus the coldest zones in the Bassian subregion are the more southerly areas and the mountain tops. For this reason, the Bassian subregion can be divided into three thermal zones, each of which appears to have a characteristic reptile fauna (Rawlinson unpublished):

1. Warm temperate zone: Coastal plains of E. New South Wales and E. Victoria; inland margins of the Eastern Highlands; and the coastal plains of SW. Victoria and SE. South Australia.
2. Cool temperate zone: Eastern Highlands in New South Wales and Victoria, including the Southern Uplands; N. and E. Tasmania.
3. Cold temperate zone: Alpine areas in E. Victoria and SE. New South Wales; highlands and S. and W. areas of Tasmania.

East Gippsland (defined as that area of Victoria E. of 148° longitude and S. of the New South Wales border) lies mainly in the warm temperate zone, but the cool temperate zone is represented in the Australian Alps and Coastal Ranges above 2000 ft. Thus distributional data for the reptiles of East Gippsland could reveal some species which are restricted to the lower elevations (warm temperate) and others which are restricted to the higher elevations (cool temperate).

The most extensive form of vegetation in East Gippsland is wet sclerophyll forest (Wood and Williams 1960), although other forms of vegetation (especially dry sclerophyll forest) are well represented in some areas. In wet sclerophyll forest, the tree stratum (consisting of all sclerophyllous trees) is dense and continuous, frequently with a discontinuous understorey of shade

Gorge of the Little River
(*A. W. Howitt, 1876.*)

tolerant trees; the shrub stratum (consisting of mesomorphic and sclerophyllous shrubs) is also dense and continuous; and the herbaceous stratum is poorly developed, although ferns may be common. Thus climax wet sclerophyll forest prevents solar radiation penetrating to the ground, except where there are natural clearings such as along rivers and creeks, around swamps, and in rocky areas. Such dense forests are largely inaccessible to heliothermic (basking) reptiles which use solar radiation for maintenance of elevated body temperatures. Thigmothermic (non-basking) reptiles can invade these forests, but, as East Gippsland is in the temperate zone where temperatures are low, this imposes a severe thermal stress and necessitates lowered thermal preferences.

Reptilian Fauna

Twenty-four of the twenty-nine species known to occur in East Gippsland are heliotherms and they are most abundant in areas where solar radiation can penetrate to the ground, e.g. the margins of rivers, creeks and swamps; rocky outcrops; burnt or cleared areas; and areas where the vegetation is open. Of the five thigmothermic species, one (*Denisonia nigrescens*) is nocturnal and the other four are fossorial litter inhabitants (*Leiolopisma delicata* and *L. mustelinum* in forest clearings at the lower altitudes, *Hemiergis decresiensis* in open vegetation such as woodland or shrubland, and *Siaphos maccoyi* in wet sclerophyll forest at the higher altitudes). It is interesting to note that only one species (*S. maccoyi*) actually lives in the wet sclerophyll forest, and that the thigmothermic families *Gekkonidae* and *Typhlopidae*, which are well represented in the warmer parts of Australia, are absent.

Recent work has suggested that there are four reptilan species complexes in SE. Australia (Rawlinson unpublished). Three of these complexes have been studied in detail, but the other is incompletely known. In spite of this, the evidence to hand shows that the *Egernia cunninghami*, *Denisonia superba* and *Notechis scutatus* complexes are represented in East Gippsland by only one taxon and the *Sphenomorphus quoyi* complex by two taxa. The complexes are discussed below under the relevant species headings.

In the following locality records, data for each species are presented under four headings:

1. Specimens examined: includes the localities of all specimens examined in the collections of the University of Melbourne Zoology Department (MUZD) and the National Museum of Victoria (NMV).
2. Specimens observed: includes the author's field records of all reptiles seen but not collected.
3. Literature records: includes all known literature records for East Gippsland.
4. Distribution: gives the general distribution of all East Gippsland reptiles based on the author's collecting in SE. Australia and reliable literature records.

CHELONIA

CHELYIDAE

Chelodina longicollis (Shaw)

SPECIMENS EXAMINED: (MUZD) Nil. (NMV) Nil.
SPECIMENS OBSERVED: Orbost; Lake Tyers.
LITERATURE RECORDS: Southern rivers of Gippsland (McCoy 1878).

DISTRIBUTION: Coastally from Tropic of Capricorn southwards to Sale region, Victoria. Also occurs throughout the Murray-Darling River system, extending from this system into SW. Victoria and SE. South Australia via the Grampians.

SQUAMATA

LACERTILIA

AGAMIDAE

Amphibolurus diemensis (Gray)

SPECIMENS EXAMINED: (MUZD) Native Dog Plain, 4½ miles SW. of Mt. Cobberas; ½ mile E. of Native Dog Plain. (NMV) Nil.

SPECIMENS OBSERVED: Nil.

LITERATURE RECORDS: Nil.

DISTRIBUTION: Tasmania, Flinders Is., highlands of E. Victoria and SE. New South Wales to the Blue Mountains.

Amphibolurus muricatus (Shaw)

SPECIMENS EXAMINED: (MUZD) Wallaby Rocks, Wulgulmerang; Buchan Caves; Mallacoota. (NMV) Snowy R.; Lakes Entrance.

SPECIMENS OBSERVED: 15 miles W. of Orbost.

LITERATURE RECORDS: Nil.

DISTRIBUTION: SE. Australia from about the Queensland border southward along the coastal and inland margins of the Eastern Highlands. Also occurs in SE. South Australia and SW. Australia.

Physignathus lesueuri (Gray)

SPECIMENS EXAMINED: (MUZD) Suggan Buggan R., Suggan Buggan; 5½ miles N. of Gelantipy; Scrubby Ck, N. of Buchan. (NMV) Upper reaches of Buchan R.; Junction of the Snowy and Broadbent Rivers; Orbost.

LITERATURE RECORDS: Upper reaches of the Buchan R. (McCoy 1878); Buchan and Snowy Rivers (Lucas and Frost 1894); Gippsland (Worrell 1963).

DISTRIBUTION: E. coast of Australia from the Cape York Peninsula (Qld.) to Walhalla in SE. Victoria. The Gippsland form has been described as a subspecies, *P. lesueuri howitti* (McCoy 1878).

SCINCIDAE

Egernia cunninghami (Gray)

Egernia cunninghami complex: This complex is poorly known, and at present it appears that there are three taxa, all of which are restricted to SE. Australia. The first taxon occurs in the E. coastal region of New South Wales, the second taxon on the W. margin of the Eastern Highlands in New South Wales and along the Murray R. into South Australia, and the third taxon on the margins of the Eastern Highlands in S. New South Wales and Victoria. The latter taxon is the only one occurring in East Gippsland.

SPECIMENS EXAMINED: (MUZD) 7 miles S. of Suggan Buggan. (NMV) Rockbank, 7 miles N. of Wulgulmerang; Gelantipy.

SPECIMENS OBSERVED: Nil.

LITERATURE RECORDS: Nil.

DISTRIBUTION: E. coast of Australia from SE. Queensland to E. Gippsland, also occurs along the inland margin of the Eastern Highlands into N. Victoria and SE. South Australia, penetrating into SW. Victoria through the Kilmore Gap.

Egernia saxatilis Cogger

Specimens Examined: (MUZD) 7 miles S. of Suggan Buggan; 2 miles N. of Cann River; 8 miles SE. of Sardine Creek. (NMV) Gelantipy; Wingan; Mt. Wills.

Specimens Observed: Bemm R., 8 miles ENE. of Bell Bird Creek.

Literature Records: Croajingolong (Lucas & Frost 1894 as *Egernia striolata*).

Distribution: Rocky outcrops along the Eastern Highland from SE. Queensland to the Grampians in W. Victoria. The Gippsland form fits Cogger's (1960) subspecies *E. saxatilis intermedia.*

Egernia whitei (Lacepede)

Specimens Examined: (MUZD) Native Dog Plain, 4½ miles SW. of Mt. Cobberas. (NMV) Buchan.

Specimens Observed: Nil.

Literature Records: Nil.

Distribution: Coastal regions and highlands of SE. Australia. Also occurs in Tasmania, the Bass Strait islands, SE. South Australia and SW. Australia.

Emoia spenceri Lucas & Frost

Specimens Examined: (MUZD) Mt. Delegate; Delegate R., 5½ miles SW. of Bendoc. (NMV) Nil.

Specimens Observed: Nil.

Literature Records: Croajingolong (Lucas & Frost 1894).

Distribution: Highlands of SE. New South Wales and E. Victoria from Mt. Franklin (A.C.T.) to Lake Mountain (Vic.). Also occurs in the Otway Ranges, SW. Victoria.

Hemiergis decresiensis (Fitzinger)

Specimens Examined: (MUZD) Nil. (NMV) Honeysuckle Track, Gelantipy; Buchan.

Specimens Observed: Nil.

Literature Records: Honeysuckle Track, Gelantipy (Brazenor 1947).

Distribution: E. New South Wales, E. Gippsland, N. Victoria, SE. South Australia and Kangaroo Is.

Leiolopisma delicata (De Vis)

Specimens Examined: (MUZD) 1½ miles N. of Goongerrah; Goongerrah Ck, Goongerrah; 12 miles N. of Cann River; Dead Calf Ck, 5 miles S. of Goongerrah; 8 miles E. of Genoa; 2 miles N. of Cann River; 2 miles N. of Mallacoota; 12 miles E. of Cann River; 15 miles NNE. of Orbost; 8½ miles ENE. of Orbost; Newtons Ck, 11½ miles W. of Cabbage Tree Creek; 2½ miles S. of Nowa Nowa; 5 miles SSW. of Nowa Nowa; Bemm River. (NMV) Cann River; Orbost.

Specimens Observed: Nil.

Literature Records: Nil.

Distribution: E. coast of Australia from SE. Queensland southward to just E. of Melbourne. Also occurs in NE. Tasmania.

Leiolopisma entrecasteauxi (Duméril & Bibron)

Specimens Examined: (MUZD) Square Flat, 2 miles NW. of Mt. Wombargo; 2 miles N. of Wulgulmerang. (NMV) Honeysuckle Track, Gelantipy.

SPECIMENS OBSERVED: Nil.

LITERATURE RECORDS: Honeysuckle Track, Gelantipy (Brazenor 1947).

DISTRIBUTION: Southward along the Eastern Highlands from Mt. Barrington (N.S.W.), extending onto the coastal plains in S. Victoria and SE. South Australia. Also occurs on the Bass Strait islands and in Tasmania where it is restricted to the N. and E. coastal plains.

Leiolopisma guichenoti (Duméril & Bibron)

SPECIMENS EXAMINED: (MUZD) Suggan Buggan; 7 miles S. of Suggan Buggan; 2 miles N. of Wulgulmerang; 5½ miles N. of Gelantipy; 5½ miles N. of Goongerrah; Goanna Ck, 1 mile N. of Goongerrah; 12 miles N. of Cann River; East Buchan; 8 miles E. of Genoa; 2 miles N. of Cann River; Poddys Ck, 8 miles NE. of Bell Bird Ck; 15 miles N. of Orbost; Bemm River. (NMV) Rockbank, 7 miles N. of Wulgulmerang; Buchan; Bruthen; Cann River; Orbost.

SPECIMENS OBSERVED: 4½ miles N. of Goongerrah.

LITERATURE RECORDS: Nil.

DISTRIBUTION: SE. and SW. Australia generally, from the coast inland to about the 20 inch isohyet. On the E. coast, *L. guichenoti* does not extend much further north than Brisbane, and it is absent from the highlands in SE. New South Wales and Victoria.

Leiolopisma mustelinum (O'Shaughnessy)

SPECIMENS EXAMINED: (MUZD) Little R., 5 miles NNE. of Wulgulmerang; 2 miles N. of Wulgulmerang; 3 miles N. of Goongerrah; Goanna Ck, 1 mile N. of Goongerrah; Martins Ck, 2½ miles N. of Sardine Creek; Buchan Caves; 2 miles N. of Cann River; 12 miles W. of Cann River; 2 miles N. of Mallacoota; Fairhaven, Mallacoota; 7 miles ENE. of Bell Bird Creek; 9 miles ENE. of Orbost; 8½ miles E. of Orbost. (NMV) Jungle at head of Basin Ck.

SPECIMENS OBSERVED: 4½ miles N. of Goongerrah.

LITERATURE RECORDS: Croajingolong (Lucas & Frost 1894).

DISTRIBUTION: E. coastal Australia from Mt. Barrington (N.S.W.) to just E. of Melbourne.

Leiolopisma trilineatum (Gray)

SPECIMENS EXAMINED: (MUZD) Suggan Buggan; Square Flat, 2 miles NW. of Mt. Wombargo; 5 miles N. of Bentleys Plains; Mabel Cave, East Buchan. (NMV) Nil.

SPECIMENS OBSERVED: Nil.

LITERATURE RECORDS: Nil.

DISTRIBUTION: Coastal and inland margins of the Eastern Highlands in SE. Australia from about the Warrumbungle Ranges south. Also occurs in SW. Australia, SE. South Australia, the Bass Strait islands and the coastal regions of N. and E. Tasmania.

Leiolopisma weeksae? Kinghorn

SPECIMENS EXAMINED: (MUZD) 2 miles N. of Wulgulmerang; 5 miles W. of Goongerrah. (NMV) Honeysuckle Track, Gelantipy.

SPECIMENS OBSERVED: Nil.

LITERATURE RECORDS: Honeysuckle Track, Gelantipy (Brazenor 1947 as *Leiolopisma metallicum*).

Distribution: Inland margin of the Eastern Highlands in SE. New South Wales from Jenolan southwards into Victoria, crossing the watershed in W. central Victoria and penetrating to the Otway Ranges.

Siaphos maccoyi Lucas & Frost

Specimens Examined: (MUZD) Ridge above Nunyong Plains; Little R., 5 miles NNE. of Wulgulmerang; 2 miles N. of Wulgulmerang; Bonang; 3 miles S. of Bonang; 5½ miles N. of Goongerrah; 4½ miles N. of Goongerrah; Goanna Ck, 1 mile N. of Goongerrah. (NMV) Rockbank, 7 miles N. of Wulgulmerang; Gelantipy; 5 miles S. of Tullochard near Gelantipy; Jungle at head of Basin Ck.; Wingan; Lakes Entrance.

Specimens Observed: Nil.

Literature Records: Croajingolong (Lucas & Frost 1894); Honeysuckle Track, Gelantipy (Brazenor 1947).

Distribution: Highlands of SE. New South Wales and E. Gippsland from Talbingo (N.S.W.) south, then extending into W. Gippsland and SW. Victoria along the forested coastal plains and southern slopes of the Eastern Highlands.

Sphenomorphus tympanum (Lonnberg & Andersson)

Sphenomorphus quoyi complex: Four morphologically distinct forms of the Water Skink, *Sphenomorphus quoyi*, occur in SE. Australia, only one of which is not restricted to the Bassian subregion. Three forms are represented by widespread and largely allopatric populations, and the other by disjunct alpine populations included within the ranges of these three. Only two of the forms (*S. quoyi* and *S. tympanum*, cool temperate form, see below) have not been found in sympatry and, as there are no indications of hybridization in sympatric populations (Rawlinson, unpublished), it appears that all forms have reached species status. A detailed account of speciation in the *S. quoyi* complex is planned, but since two of the taxa occur in East Gippsland, a summary of the nomenclatorial conclusions seems desirable at this stage.

Quoy and Gaimard (1824) described and figured a skink collected at Neutral Bay, Sydney. They did not name it as a new species, however, simply referring to it as the 'Scinque à flancs noirs'. Duméril and Bibron (1839) re-described the specimen and named it as a new species, *Lygosoma quoyi*. Following the most recent revision of lygosomid skinks (Mittleman, 1952) this species is currently known as *Sphenomorphus quoyi*. Lonnberg and Andersson (1913) described and named a new skink, *Lygosoma tympanum*, 'said to have been collected in the neighbourhood of Melbourne'. Subsequently, Kinghorn (1932) described a new skink from Mt. Kosciusko which he named *Hinulia quoyi kosciuskoi*. Loveridge (1934) placed *tympanum* in the genus *Sphenomorphus* and made it a subspecies of *S. quoyi*. At the same time he synonymized *kosciuskoi* with *tympanum*.

Collections made at type localities, comparisons of topotypes to original descriptions, examination of the original figure of *S. quoyi* (Quoy and Gaimard, 1824, Pl. 42, fig. 1) and the type series of *S. quoyi kosciuskoi* (Australian Museum) have enabled positive identifications to be made of *quoyi*, *tympanum* and *kosciuskoi*. These taxa represent three of the four morphological forms of the *S. quoyi* complex. The fourth taxon is closely related to *tympanum*, but is apparently undescribed. It has previously been referred to as *Sphenomorphus sp. nov.* (Rawlinson, 1967). As my unpublished results indicate that Loveridge (1934) was wrong in synonymizing *tympanum* and *kosciuskoi*, the two taxa are re-established in this paper. Also, as my evidence indicates that all taxa have reached species status, *tympanum* is restored to specific rank. This explains the use of the name *Sphenomorphus tympanum* in this paper.

In East Gippsland, *S. tympanum* and the closely related undescribed form occur. Locality data for each taxon must therefore be separated, so *S. tympanum* (*sensu lato*) has been divided into two groups. The first group, described as the 'Cool Temperate Form', is the typical form of *S. tympanum*. The second group, described as the 'Warm Temperate Form', is the undescribed (and probably specifically distinct) form of *S. tympanum*.

COOL TEMPERATE FORM

SPECIMENS EXAMINED: (MUZD) Quambat Plain, 7½ miles NNE. of Mt. Cobberas; Head of Indi R., 1½ miles E. of Quambat Plain; Native Dog Plain, 4½ miles SW. of Mt. Cobberas; Ridge above Nunyong Plains; Back R. bridge, 5 miles N. of Bentleys Plains; 2 miles N. of Wulgulmerang; 5½ miles N. of Gelantipy; Mt. Delegate; 2½ miles SW. of Bendoc; 11 miles SW. of Bendoc; 8½ miles N. of Goongerrah; 7½ miles N. of Goongerrah; 5½ miles N. of Goongerrah; 4½ miles N. of Goongerrah; 5 miles W. of Goongerrah. (NMV) Wombargo Ck, 7 miles SW. of Suggan Buggan; Rockbank, Wombargo Ck, 7 miles N. of Wulgulmerang; Honeysuckle Track, Gelantipy.

SPECIMENS OBSERVED: Nil.

LITERATURE RECORDS: Wombargo Ck 3000′, 5 miles W. of Suggan Buggan (Brazenor 1947).

DISTRIBUTION: Highlands of SE. New South Wales and Victoria, from the Brindabella Ranges (A.C.T.) southward. Occurs throughout the Victorian coastal plains from Stradbroke (W. Gippsland) W. to about Mt. Richmond (SW. Victoria).

WARM TEMPERATE FORM

SPECIMENS EXAMINED: (MUZD) Native Dog Plain, 4½ miles SW. of Mt. Cobberas; Ingeegoodbee R., 5 miles N. of Suggan Buggan; 4 miles S. of Willis; Suggan Buggan R., Suggan Buggan; Tullochard Gorge, 3 miles W. of Butchers Ridge on Snowy R.; 5 miles N. of Goongerrah; 1 mile N. of Goongerrah; Goongerrah Ck, Goongerrah; 5 miles N. of Chandlers Creek; Junction of Murrindal R. and Butchers Ck, 12 miles NNE. of Buchan; Martins Ck, 10 miles SSE. of Goongerrah; Martins Ck, 2½ miles N. of Sardine Creek; Buchan R., 1 mile W. of Murrindal; Murrindal R., ½ mile E. of Murrindal; ½ mile E. of Genoa; Wild Dog Ck, 4 miles S. of Sardine Creek; 2 miles N. of Cann River; Wingan R., 10½ miles ESE. of Genoa; 8 miles SE. of Sardine Creek; 15 miles NNE. of Orbost; 9 miles ENE. of Orbost; Poddys Ck, 8 miles E. of Bell Bird Creek; 10 miles E. of Orbost; 8½ miles E. of Orbost; Bell Bird Creek; 2 miles N. of Bemm River; Bemm River. (NMV) Rockbank, Wombargo Ck, 7 miles N. of Wulgulmerang; Junction of Snowy and Broadbent Rivers; Snowy R. Gorge; Mouth of Betka R., Mallacoota; 10 miles S. of Buchan; Cann River; Orbost; Wingan Inlet.

SPECIMENS OBSERVED: Nil.

LITERATURE RECORDS: Honeysuckle Track, near Gelantipy (Brazenor 1947).

DISTRIBUTION: Highlands of NE. New South Wales, coastal and inland margins of the Eastern Highlands in SE. New South Wales and NE. and SE. Victoria. Also occurs on the Fleurieu Peninsula, South Australia.

Tiliqua casuarinae (Duméril & Bibron)

SPECIMENS EXAMINED: (MUZD) Genoa; Gipsy Point. (NMV) Nil.

SPECIMENS OBSERVED: Nil.

Literature Records: Nil.

Distribution: Highlands and coastal regions of E. New South Wales and E. Gippsland from about Gosford (N.S.W.) southward to Mt. Hotham (Vic.). Also occurs in Tasmania where it is widespread.

Tiliqua nigrolutea (Quoy & Gaimard)

Specimens Examined: (MUZD) Suggan Buggan; 7 miles SW. of Bonang. (NMV) Gelantipy.

Specimens Observed: Tongio West.

Literature Records: Nil.

Distribution: Highlands of E. New South Wales and Victoria from about Gosford (N.S.W.) southward, extending onto the coastal plains in W. Gippsland, SW. Victoria and SE. South Australia. Also occurs in Tasmania and the Bass Strait islands, where it is widely distributed.

Tiliqua scincoides (Shaw)

Specimens Examined: (MUZD) Nil. (NMV) Nil.

Specimens Observed: Mallacoota; 16 miles WNW. of Orbost; 14½ miles WNW. of Orbost; 4 miles WSW. of Orbost.

Literature Records: Nil.

Distribution: Occurs throughout N. and E. Australia inside the 20 inch isohyet, missing only the highland regions of SE. New South Wales and E. Victoria (including the S. Gippsland Highlands). *T. scincoides* does not occur any farther W. than Adelaide (S.A.). Mitchell (1955) described the N. Australian form as a subspecies, *T. scincoides intermedia*.

VARANIDAE

Varanus varius (Shaw)

Specimens Examined: (MUZD) Nil. (NMV) Junction of Snowy and Broadbent Rivers.

Specimens Observed: 15 miles N. of Orbost; 17 miles WSW. of Cann River; 13 miles E. of Bruthen; 12½ miles E. of Nowa Nowa; 3 miles E. of Cabbage Tree Creek.

Literature Records: Cabbage Tree Creek; Andersons Inlet (Lucas & Frost 1894).

Distribution: Throughout E. Australia inside the 20 inch isohyet, extending as far W. as Kangaroo Is. (S.A.). Does not occur in the highlands of SE. New South Wales and Victoria, or in W. Gippsland and SW. Victoria.

OPHIDIA

BOIDAE

Morelia argus argus (Linnaeus)

Specimens Examined: (MUZD) Nil. (NMV) 5 miles SSW. of Mallacoota.

Specimens Observed: Nil.

Literature Records: Worrell (1963) records the species from Eden, New South Wales.

Distribution: Coastal region of SE. Australia from Coffs Harbour (N.S.W.) to Mallacoota (Vic.). A subspecies, *M. argus variegata* is widely distributed over the rest of Australia except for S. Victoria and Tasmania.

ELAPIDAE

Demansia textilis (Duméril & Bibron)

SPECIMENS EXAMINED: (MUZD) Murrindal. (NMV) Gelantipy; Genoa.

SPECIMENS OBSERVED: 1 mile N. of Buchan; 3 miles S. of Genoa.

LITERATURE RECORDS: Nil.

DISTRIBUTION: In E. Australia, *D. textilis* is common on the dry inland plains. The species also penetrates down the E. coast into E. Gippsland and through the Kilmore Gap into the SW. Victorian plains, but it is absent from the highlands of SE. New South Wales and Victoria (including the S. Gippsland Highlands). The range of the species to the W. is unknown, as the taxonomic status of W. populations of *Demansia* has not been determined.

Denisonia coronoides (Günther)

SPECIMENS EXAMINED: (MUZD) Nil. (NMV) Orbost.

SPECIMENS OBSERVED: Native Dog Plain, 4½ miles SW. of Mt. Cobberas; Morass Ck, 5 miles S. of Mt. Misery.

LITERATURE RECORDS: Nil.

DISTRIBUTION: Coastal and highland regions of SE. Australia from Sydney southwards to Mt. Gambier in South Australia. Also occurs on the Bass Strait islands and Tasmania.

Denisonia nigrescens (Günther)

SPECIMENS EXAMINED: (MUZD) 8½ miles ENE. of Orbost; 5 miles SSW. of Nowa Nowa. (NMV) Orbost.

SPECIMENS OBSERVED: Wulgulmerang area; 5 miles S. of Buchan.

LITERATURE RECORDS: Nil.

DISTRIBUTION: Coastal regions of E. Australia from Cape York (Qld.) to just E. of Melbourne.

Denisonia superba (Günther)

Denisonia superba complex: This complex is restricted to the cool and cold temperate zones of the Bassian subregion (as defined in the introduction). There are two taxa in the complex, and these are represented by widespread and largely allopatric populations which overlap along the southern margin of the Eastern Highlands in E. Victoria. Although the two forms overlap extensively, especially to the NE. of Melbourne, sympatric populations have not been found to date. However, it appears that the two taxa have reached species status as no evidence of hybridization has been observed in specimens from the overlap zone. One taxon occurs in Tasmania, the Bass Strait islands, S. Victoria and SE. South Australia. This taxon (apparently the nominal form, as most of the type series came from Tasmania) has been designated the 'Lowlands Form' as where the two taxa contact, it is restricted to the lower altitudes. The second taxon occurs in the highlands of E. Victoria and E. New South Wales, with isolates in the Mt. Lofty Ranges and Kangaroo Island, South Australia. This is the only taxon found in East Gippsland and it has been designated the 'Highlands Form' as it is restricted to the higher altitudes where the two taxa contact. Rawlinson (1967) has previously referred to this form as *Denisonia sp. nov.*

HIGHLANDS FORM

SPECIMENS EXAMINED: (MUZD) Native Dog Plain, 4½ miles SW. of Mt. Cobberas; Morass Ck, 5 miles S. of Mt. Misery; 6 miles N. of Benambra; 4 miles

S. of Wulgulmerang; 3 mile S. of Gelantipy. (NMV) Benambra; Gelantipy; Bruthen.

SPECIMENS OBSERVED: 2 miles N. of Wulgulmerang; 4 miles N. of Gelantipy; Bonang; 3 miles N. of Sardine Creek.

LITERATURE RECORDS: Nil.

DISTRIBUTION: *Highlands form*: Highlands of SE. Australia from New England Tableland (N.S.W.) to Lake Mountain (Vic.). There is an isolate in the Mt. Lofty Ranges and on Kangaroo Is., South Australia. *Lowlands form*: Highlands of S. Gippsland and coastal plains of W. Gippsland, SW. Victoria and SE. South Australia. This form also occurs on the Bass Strait islands and in Tasmania.

Notechis scutatus (Peters)

Notechis scutatus complex: The genus *Notechis* is restricted to the Bassian subregion (*sensu* Serventy and Whittell, 1951). Two species and four subspecies have been described in the genus. However results of recent work (Rawlinson, 1967 and unpublished) have indicated that there are only two taxa—the two described species, *N. ater* and *N. scutatus*. *N. ater* has a disjunct distribution from Tasmania, through South Australia to S. Western Australia, while *N. scutatus* has a continuous distribution throughout the warm and cool temperate SE. of Australia. The latter taxon is the only one found in East Gippsland.

SPECIMENS EXAMINED: (MUZD) Morass Ck, 5 miles S. of Mt. Misery. (NMV) Orbost; Lakes Entrance; Croajingolong.

SPECIMENS OBSERVED: Nil.

LITERATURE RECORDS: Nil.

DISTRIBUTION: SE. Australia inside the 20 inch isohyet from Mt. Tambo (SE. Qld.) to Kangaroo Is. (S.A.). A closely related species, *N. ater*, occurs on Tasmania and the Bass Strait islands; the Flinders Ranges, Yorke and Eyre Peninsulas and offshore islands, South Australia; and SW. Australia (Rawlinson, 1967).

Pseudechis porphyriacus (Shaw)

SPECIMENS EXAMINED: (MUZD) 8 miles N. of Murrindal; 12 miles W. of Cann River; Lake Tyers. (NMV) Gelantipy; Tullochard, near Gelantipy.

SPECIMENS OBSERVED: 2 miles N. of Wulgulmerang; 15 miles N. of Buchan; 8 miles NE. of Genoa; 3 miles W. of Cann River; 1 mile W. of Cann River; 8 miles N. of Orbost; Bell Bird Creek; 5 miles W. of Nowa Nowa; 8 miles E. of Orbost.

LITERATURE RECORDS: Nil.

DISTRIBUTION: Coastal regions of E. Australia from Cape York (Qld.) to about Sale (Vic.). Crosses the Eastern Highlands in Queensland and penetrates along the Murray-Darling River system into South Australia. Also occurs along the inland margin of the Eastern Highlands in SE. Australia, penetrating into SW. Victoria through the Kilmore Gap.

Discussion

Twenty-nine reptile species are recorded from East Gippsland in this paper, 22 for the first time. The distributional data provided above for these species can be discussed along two main lines to reach separate, but related, conclusions. This is done under two headings:

1. Main reptile distribution patterns in East Gippsland.

2. The East Gippsland reptile fauna in relation to Australian zoogeographic subregions.

Before continuing, several points should be clarified. The present paper deals only with the reptiles of East Gippsland, but the ideas developed below are an expansion of previously published work on the reptiles of SE. Australia (Rawlinson, 1966, 1967). A checklist of the reptiles of SE. Victoria (Gippsland) and SW. Victoria was provided in one of these papers (Rawlinson, 1967, Table 1), but this has since proved inaccurate on four counts (Rawlinson, unpublished): 2 species, *Egernia luctuosa*, and *Morelia argus argus*, can now be added to the SE. Victorian list, bringing the total number of species to 33; 1 species, *Emoia spenceri*, can be added to the SW. Victorian list and 1 species, *Leiolopisma metallicum*, can be removed, the total number of species remaining at 30. On the latter point, recent evidence (Rawlinson, unpublished) has suggested that *L. metallicum* is absent from Western Australia, records for this species apparently being

Table 1

Distribution patterns of East Gippsland reptile species

Species	Thermal Zones occupied in East Gippsland			Zoogeographic Distribution		
	Warm Temperate only	Cool Temperate only	Warm and Cool Temperate	Exclusive Bassian	Transitional from Torresian	Transitional from Eyrean
Chelodina longicollis	+	—	—	—	+	—
Amphibolurus diemensis	—	+	—	+	—	—
A. muricatus	+	—	—	+	—	—
Physignathus lesueuri	+	—	—	—	+	—
Egernia cunninghami	+	—	—	+	—	—
E. saxatilis	—	—	+	+	—	—
E. whitei	—	—	+	+	—	—
Emoia spenceri	—	+	—	+	—	—
Hemiergis decresiensis	+	—	—	+	—	—
Leiolopisma delicata	—	—	+	+	—	—
L. entrecasteauxi	—	+	—	+	—	—
L. guichenoti	—	—	+	+	—	—
L. mustelinum	—	—	+	+	—	—
L. trilineatum	—	—	+	+	—	—
L. weeksae ?	—	+	—	+	—	—
Siaphos maccoyi	—	+	—	+	—	—
Sphenomorphus tympanum (Cool Temperate Form)	—	+	—	+	—	—
Sphenomorphus tympanum (Warm Temperate Form)	+	—	—	+	—	—
Tiliqua casuarinae	—	—	+	+	—	—
T. nigrolutea	—	+	—	+	—	—
T. scincoides	+	—	—	—	+	—
Varanus varius	+	—	—	—	+	—
Morelia argus argus	+	—	—	+	—	—
Demansia textilis	+	—	—	—	—	+
Denisonia coronoides	—	+	—	+	—	—
D. nigrescens	+	—	—	—	+	—
D. superba	—	+	—	+	—	—
Notechis scutatus	—	—	+	+	—	—
Pseudechis porphyriacus	+	—	—	—	+	—
Total	12	9	8	22	6	1

attributable to *L. guichenoti*, or a closely related form. The reptilian fauna of SE. Victoria thus includes at least 33 species, and 29 of these are known to occur in East Gippsland, the absentees being *Egernia luctuosa*, *Leiolopisma metallicum*, *Rhodona bougainvilli* and *Denisonia superba* (Lowlands form).

1. MAIN REPTILE DISTRIBUTION PATTERNS IN EAST GIPPSLAND

East Gippsland can be divided into two thermal zones (warm and cool temperate) as a consequence of the low and high altitudes (see introduction). The locality data provided above indicate that 12 species are restricted to the warm temperate zone, 9 species to the cool temperate zone and 8 species occur in both zones (see Table 1). This breakdown of East Gippsland reptile species agrees with their distribution in the warm and cool temperate zones of the Bassian subregion outside East Gippsland.

2. THE EAST GIPPSLAND REPTILE FAUNA IN RELATION TO AUSTRALIAN ZOOGEOGRAPHIC SUBREGIONS

The most generally accepted scheme for subdividing Australia into zoogeographic subregions is that proposed by Spencer (1896) and subsequently modified by Serventy and Whittell (1951) (see reviews in Keast, 1959 and Littlejohn 1967). In this scheme, four subregions are recognized: the temperate Bassian and South-Western subregions; the tropical Torresian subregion; and the arid Eyrean subregion. Burbidge (1960) has proposed almost identical divisions for the principle floristic zones in Australia: Tropical zone (= Torresian); Temperate zone (= Bassian and South-Western); and Eremaean zone (= Eyrean). As was mentioned in the introduction, Gippsland lies in the Bassian zoogeographic subregion, and Rawlinson (1966, 1967) has described its reptile fauna as Bassian, but without providing the data and principles on which this conclusion was based. Detailed distributional data on the reptiles of East Gippsland have been provided above, and the discussion can be developed to explain how these data fit the Bassian subregion concept.

Darlington (1957, pp. 419-428), when discussing the concept of zoogeographic regions, states: 'that the faunal regions are designed to represent the main features of distribution of *existing* animals, and that, although the causes that have produced present distributions lie in the past, any attempt to combine the past with the present in one system of regions must lead to confusion'. Thus zoogeographic regions must be based on static patterns, and Darlington (op. cit.) concludes: 'The system of faunal regions, then, represents the average, gross, pattern of many different animals with more or less different distributions'. This effectively summarizes the basis for dividing the Earth into zoogeographic regions, but it does not give a working idea of how such regions can be recognized. Keast (1959, p. 129), following Mayr (1945), provides definitions of regions and subregions based on the faunal elements to be expected: 'A zoogeographic region may be defined as a geographic subdivision of the Earth that is the home of a peculiar fauna. Such a region is characterized by the presence of many endemic genera and families and by the absence of the characteristic genera and families of other zoogeographic regions. A sub-region or faunal province by contrast can be held to be a somewhat lesser division, characterized by a series of endemic forms of lesser degree'. Using this definition, Rawlinson (1966) showed that there are great differences between the Bassian and Eyrean reptile faunas at the specific, generic and familial levels; and a similar, but less marked, difference exists between the Bassian and Torresian reptile faunas (Rawlinson, unpublished).

Few Bassian reptile taxa (especially species) have distributions co-extensive with the boundary of the Bassian subregion and there is no sharp cut-off of distributions at the Bassian boundary. This is not surprising, for Darlington (1957, p. 198), when discussing transitions and barriers in the distribution of reptiles between faunal regions, states: 'Where different faunas of reptiles meet there are not sharp boundaries but broad areas of transition—overlapping with progressive subtractions'. However, this presents another problem: which of the reptilian taxa occurring within the boundaries of the Bassian subregion are Bassian faunal elements, and how do the remaining taxa fit into the subregion concept? Darlington (1957, pp. 453-456) provides an answer to these questions when he points out that where two faunal regions are separated by partial barriers, complex transitions are to be expected, with overlapping of faunal elements and progressive subtraction in both directions. As a result of these transitions, the taxa in two partially separated regions can be divided into three categories:

1. Exclusive taxa: occur in one region only; these taxa delimit the region.
2. Transitional taxa: occur in both regions, but are extensive in one region and limited in the other.
3. Shared taxa: occur throughout both regions.

Burbidge (1960) recognized the significance of transition zones when she divided Australia into the three principal floristic zones mentioned earlier. Between these zones she has areas of transition which are divided into two categories:

(a) Interzones 1, 2 and 3; between the SW. Temperate and Eremaean, SE. Temperate and Eremaean and Tropical and Eremaean zones respectively. These are apparently simple areas of overlap with progressive subtraction in both directions.
(b) MacPherson MacLeay overlap; between the Tropical and SE. Tem-

TABLE 2

Zoogeographic elements present in the East Gippsland reptile fauna

Possible Distribution Pattern	Number of Taxa			
	Species	Super-Species	Genera	Families
1. Exclusive Bassian	22	3	1	—
2. Transitional Bassian to Torresian	—	—	1	—
3. Transitional Bassian to Eyrean	—	—	—	—
4. Transitional Bassian to Torresian and Eyrean	—	—	—	—
5. Transitional Torresian to Bassian	6	1	3	1
6. Transitional Eyrean to Bassian	1	—	1	—
7. Transitional Torresian and Eyrean to Bassian	—	—	5	2
8. Transitional Torresian to Eyrean and Bassian	—	—	—	—
9. Transitional Eyrean to Torresian and Bassian	—	—	—	—
10. Shared Bassian and Torresian	—	—	1	—
11. Shared Bassian and Eyrean	—	—	—	—
12. Shared Bassian and Torresian and Eyrean	—	—	4	3
Total	29	4	16	6

perate zones. This area is apparently a mosaic of Tropical and Temperate communities with progressive subtraction in both directions.

As the Bassian subregion is only partially separated from the adjacent subregions (Eyrean and Torresian), exclusive, transitional and shared taxa (species, genera and families) may be expected in the fauna. The East Gippsland reptile fauna then, could contain 12 zoogeographic elements, but Table 2 shows that only 7 of these possible categories are represented; 3 at the specific level, 2 at the superspecific (*sensu* Mayr, 1963) level, 7 at the generic level and 3 at the familial level.

Of the 29 species recorded from East Gippsland, 22 are exclusive to the Bassian, 6 are transitional from the Torresian and 1 is transitional from the Eyrean. These are all listed in Table 1.

At the superspecific (*sensu* Mayr, 1963) level, there are members of 4 species complexes present in East Gippsland; 3 (the *Egernia cunninghami*, *Denisonia superba* and *Notechis scutatus* complexes), are exclusively Bassian; and 1 (the *Sphenomorphus quoyi* complex), is transitional from the Torresian to the Bassian.

At the generic level, the East Gippsland reptilian fauna has: 1 exclusive Bassian genus (*Notechis*); 1 genus transitional from the Bassian to the Torresian (*Leiolopisma*); 3 genera transitional from the Torresian to the Bassian (*Chelodina*, *Emoia* and *Siaphos*); 1 genus transitional from the Eyrean to the Bassian (*Hemiergis*); 5 genera transitional from the Torresian and Eyrean to the Bassian (*Physignathus*, *Varanus*, *Morelia*, *Demansia* and *Pseudechis*); 1 genus shared between the Bassian and Torresian (*Sphenomorphus*); and 4 genera shared between the Bassian, Torresian and Eyrean (*Amphibolurus*, *Egernia*, *Tiliqua* and *Denisonia*).

At the familial level, the East Gippsland reptilian fauna has: 1 family transitional from the Torresian to the Bassian (*Chelyidae*); 2 families transitional from the Torresian and Eyrean to the Bassian (*Varanidae* and *Boidae*); and 3 families shared between the Bassian, Torresian and Eyrean (*Agamidae*, *Scincidae* and *Elapidae*).

The above analysis of the East Gippsland reptilian fauna reveals that it is essentially Bassian in nature, but the presence of the warm temperate zone has enabled certain transitional Torresian and Eyrean taxa to become established. The evidence presented indicates that it has been easier for Torresian taxa to become established in the area. These points are best exemplified at the specific level where 76% of the species are exclusively Bassian, 21% are transitional from the Torresian and 3% are transitional from the Eyrean. The higher taxonomic categories present a less clear picture: 3 species complexes (or superspecies, *sensu* Mayr, 1963) are exclusively Bassian; 1 genus is exclusively Bassian and 1 genus is transitional from the Bassian to the Torresian. All other taxa are transitional from, or shared with, the Torresian or Eyrean, but a stronger link with the Torresian is evident.

Conclusions

1. East Gippsland can be divided into two thermal zones, the warm and cool temperate, each of which has its own reptilian fauna.

2. Following the principles for zoogeographic regions and subregions laid down by Darlington (1957) and Keast (1959), the East Gippsland reptile fauna is considered to be Bassian in nature, but the warm temperate zone has enabled transitional Torresian and Eyrean taxa to become established.

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